| | Application No. | Applicant(s) |
|---|---|---|
| **Notice of Allowability** | 10/848,869 | GU ET AL. |
| | **Examiner** | **Art Unit** | |
| | Bai D. Vu | 2165 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--*

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *10/22/2009*.

2. ☒ The allowed claim(s) is/are *1,3-11 and 13-25*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All    b) ☐ Some*    c) ☐ None    of the:

        1. ☐ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the

            International Bureau (PCT Rule 17.2(a)).

    * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of

        Paper No./Mail Date _____.

    **Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application

6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____.

/Neveen Abel-Jalil/
Supervisory Patent Examiner, Art Unit 2165

## DETAILED ACTION

1.      This office action is response to applicant's arguments filed on 10/22/2009. Claims 1-11

and 13-21 are pending in this office action.

## EXAMINER'S AMENDMENT

2.      An examiner's amendment to the record appears below. Should the changes and/or

additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the

payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with

Mr. Omkar K. Suryadevara on January 5, 2010 and January 12, 2010.

3.      **In specification:** Please replace the paragraphs [0041] – [0044] with amended

paragraphs [0041] – [0044] as provided below:


[0041] As described elsewhere herein, vector reads for array updates are

performed by computer system 400 in response to processor 405 executing one or

more sequences of one or more instructions contained in main memory 406. Such

instructions may be read into main memory 406 from another computer-readable

storage medium, such as storage device 410. Execution of the sequences of

instructions contained in main memory 406 causes processor 405 to perform the

process steps described herein. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with software instructions to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware circuitry and software.

[0042] The term "computer-readable storage medium" as used herein refers to any storage medium that participates in providing instructions to processor 405 for execution. Such a storage medium may take many forms, including but not limited to, non-volatile storage media, and volatile storage media, and transmission media. Non-volatile storage media includes, for example, optical or magnetic disks, such as storage device 410. Volatile storage media includes dynamic memory, such as main memory 406. Transmission media includes coaxial cables, copper wire and fiber optics, including the wires that comprise bus 402. Transmission media can also take the form of acoustic or light waves, such as those generated during radio-wave and infra-red data communications.

[0043] Common forms of computer-readable storage media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other storage medium from which a computer can read.

[0044] Various forms of computer readable <u>storage</u> media may be involved in

carrying one or more sequences of one or more instructions to processor 405 for

execution. For example, the instructions may initially be carried on a magnetic disk of a

remote computer. The remote computer can load the instructions into its dynamic

memory and send the instructions over a telephone line using a modem. A modem local

to computer system 400 can receive the data on the telephone line and use an infra-red

transmitter to convert the data to an infra-red signal. An infra-red detector can receive

the data carried in the infra-red signal and appropriate circuitry can place the data on

bus 402. Bus 402 carries the data to main memory 406, from which processor 405

retrieves and executes the instructions. The instructions received by main memory 406

may optionally be stored on storage device 410 either before or after execution by

processor 405.

<u>Notes regarding the specification amendment</u>: the deletion of non-statutory

subject matter is considered a clear disavowal of such subject matter in the definition of

"computer readable medium".

4.    **In claims**: Please replace claims 1, 3, 6, 8, 10, 11 and 13-21 with amended claims 1, 3,

6, 8, 10, 11 and 13-21; cancel claim 2; and add new claims 22-25 as follows:

1. (Currently amended): A method implemented in a computer, the method comprising:

generating an array update operation based on a query to update a relational database;

wherein said array update operation specifies a plurality of row-identifier and value pairs to update multiple rows in a table of said relational database;

repeatedly finding, and storing in a structure, a block-identifier of a block that contains a row of data identified by a row-identifier in at least a group of row-identifier and value pairs in said plurality, by use of a database index prior to retrieval of the block;

wherein said structure is located in ~~main~~ a memory of said computer;

wherein each value comprises data to be updated in said row identified by said row-identifier;

performing a single access operation without context switching, to retrieve from a storage device and <u>to</u> store in a cache, a ~~number~~ <u>plurality</u> of blocks of data of said table, said blocks being identified by a corresponding ~~number~~ <u>plurality</u> of block-identifiers in the structure;

wherein several of said blocks are non-contiguous in said storage device; and

repeatedly updating, in blocks in the cache, each row identified in the group of row-identifier and value pairs, using a corresponding value in the row-identifier and value pairs<u>; and</u>

<u>sorting the block-identifiers, prior to retrieval of the blocks by performing the single access operation</u>.


2. (Cancelled).


3. (Currently amended): The method of claim [[2]] <u>1</u> wherein: the sorting is performed subsequent to storage of the block-identifiers in the structure.

6. (Currently amended): The method of claim 1 wherein: ~~the database index is a hash index and~~ the table is organized in a hash cluster~~; and during said finding, a single directory is used to obtain the block identifier~~.

8. (Currently amended): The method of claim 1 wherein: said structure comprises an array; and the array has a ~~number~~ <u>plurality</u> of entries identical <u>in number</u> to the ~~number~~ <u>plurality</u> of blocks ~~that can be~~ held in the cache.

10. (Currently amended): The ~~method~~ <u>one or more storage media</u> of claim [[1]] <u>13</u> further comprising:

     ~~unpinning~~ <u>instructions to unpin</u> each block after updating all rows in said each block; and

     ~~flushing~~ <u>instructions to flush</u> an unpinned block to said storage device only when another block needs space in the cache occupied by the unpinned block.

11. (Currently amended): The ~~method~~ <u>one or more storage media</u> of claim [[1]] <u>13</u> wherein:

     a plurality of file offsets are provided to the single access operation, one file offset for each block in the group;

     wherein each file offset is an offset in a file from where reading of data is to begin.

13. (Currently amended): ~~A non-volatile media~~ One or more storage media in which are stored instructions to perform a computer-implemented method, the instructions comprising:

~~generating~~ instructions to generate an array update operation based on a query to update a relational database;

wherein said array update operation specifies a plurality of row-identifier and value pairs to update multiple rows in a table of said relational database;

~~repeatedly finding, and storing~~ instructions to repeatedly find and store in a structure, a block-identifier of a block that contains a row identified by a row-identifier in at least a group of row-identifier and value pairs in said plurality, by use of a database index of [[a]] said relational database;

~~performing~~ instructions to invoke performance of a ~~vector-read~~ single operation without context switching during said ~~performing~~ performance, to retrieve from a storage device and to store in a cache, a ~~number~~ plurality of blocks, said blocks being identified by block-identifiers in the structure; ~~and~~

~~repeatedly updating,~~ instructions to repeatedly update in blocks in the cache, each row identified in the group of row-identifier and value pairs, using a corresponding value in the row-identifier and value pairs;

wherein several of said blocks are non-contiguous in said storage device; and

instructions to sort the block-identifiers, prior to retrieval of the blocks by performing the single access operation.

14. (Currently amended): The ~~non-volatile~~ one or more storage media of claim 13 ~~being further encoded with~~ further comprising said structure storing the block-identifiers.

15. (Currently amended): A computer comprising a processor and ~~a memory~~ one or more storage media coupled to the processor, the ~~memory being encoded with instructions to~~ one or more storage media comprising:

instructions to automatically generate an array update operation based on a query to update a relational database;

instructions to automatically use a database index to look up a block-identifier of a block that contains a row identified by an identifier in a plurality of identifier and value pairs to be used to perform said array update operation on a table in said relational database;

instructions to automatically store the block-identifier in a structure in memory;

instructions to automatically repeat said instructions to ~~said~~ automatically use and said instructions to automatically store, for all identifiers in at least a group of identifier and value pairs in said plurality;

instructions to automatically perform a vector read operation, to retrieve from a disk and store in a cache, each block in a group of blocks identified by block-identifiers stored in said structure, wherein the group of blocks are all stored in the cache during execution of a single function call;

wherein several of said blocks in the group are non-contiguous in said disk;

instructions to automatically modify a row in a block stored in the cache, using a value in the plurality of identifier and value pairs; ~~and~~

instructions to automatically repeat said instructions to ~~said~~ automatically modify, with

each row identified in the group of identifier and value pairs; and

instructions to sort said block-identifiers prior to retrieval of the blocks from the storage

device by performing the single access operation.

16. (Currently amended): An apparatus comprising a database, the apparatus

comprising:

means for generating an array update operation based on a query to update the

database;

wherein said array update operation specifies a plurality of row-identifier and value pairs

to update multiple rows in a table of the database;

means for using a database index to look up a block-identifier of a block that contains

the row identified by an identifier in the plurality of identifier and value pairs;

means for storing the block-identifier in a structure in memory;

means for repeating (using the database index to look up and storing the block-

identifier), for all identifiers in at least a group of identifier and value pairs;

means for ~~performing~~ invoking performance of a vector read operation without context

switching, to retrieve from a disk and store in a cache, each block in a group of blocks

identified by block-identifiers stored in said structure, wherein the group of blocks are all stored

in the cache during execution of a single function call;

wherein several of said blocks in the group are non-contiguous in said disk;

means for modifying a row in a block stored in the cache, using a value in the plurality of

identifier and value pairs; and

means for repeating said modifying with each row identified in the group of identifier and

value pairs;

wherein said block-identifiers are sorted prior to retrieval of the blocks from the storage

device by performing the single access operation.


17. (Currently amended): ~~A method implemented~~ One or more storage media

comprising instructions to perform a method implemented in a computer, the ~~method~~ one or

more storage media comprising:

~~generating~~ instructions to generate an array update operation based on a query to

update a database;

wherein said array update operation specifies a plurality of row-identifier and value pairs

to update multiple rows in a table of said database;

~~finding~~ instructions to find a block-identifier of a block that contains the row identified by

a row-identifier in a row-identifier and value pair in said plurality, by use of a database index in

said database;

~~storing~~ instructions to store the block-identifier in a structure in memory;

~~repeating~~ instructions to repeatedly (~~finding~~ find the block-identifier and ~~storing~~ store the

block-identifier), for all row-identifiers in at least a group of row-identifier and value pairs in said

plurality;

~~performing~~ instructions to invoke performance of a vector read operation without context switching during said ~~performing~~ performance, to retrieve from a storage device and store in a cache, each block in a group of blocks identified by block-identifiers stored in said structure, wherein the group of blocks are all stored in the cache during execution of a single function call;

wherein several of said blocks in the group are non-contiguous in said storage device;

~~updating~~ instructions to update the row in the block in the cache, using the value in the row-identifier and value pair; ~~and~~

~~repeating said updating~~ instructions to repeatedly execute said instructions to update, with each row identified in the group of row-identifier and value pairs; and

instructions to sort said block-identifiers prior to retrieval of the blocks from the storage device by performing the single access operation.

18. (Currently amended): The ~~non-volatile~~ one or more storage media of claim 13 ~~being comprised in~~ comprising at least one of a disk, a chip and a cartridge.

19. (Currently amended): The ~~method~~ one or more storage media of claim [[2]] 13 wherein:

the blocks are sorted during execution of said ~~sorting~~ instructions to sort based on adjacency such that during performance of said single access operation, block-identifiers of blocks physically adjacent to one another at a periphery of a disk in the storage device are presented at one time to the storage device and identifiers of blocks that are physically

adjacent to one another and located closer to a center of the disk are presented at another time.

20. (Currently amended): The computer of claim 15 wherein:

the blocks are sorted during ~~said single function call~~ execution of said instructions to sort based on adjacency such that block-identifiers of blocks physically adjacent to one another at a periphery of said disk are presented at one time to a disk drive comprising said disk and identifiers of blocks that are physically adjacent to one another and located closer to a center of said disk are presented at another time.

21. (Currently amended): The ~~method of Claim 9~~ one or more storage media of claim 13 further comprising: ~~performing~~ instructions to perform a write operation from said cache to said storage device when space is needed in said cache.

22. (New): The one or more storage media of claim 13 further comprising: instructions to store a row of said table in a hash cluster.

23. (New): The one or more storage media of claim 13 wherein said storage device comprises at least one of a disk, a chip and a cartridge.

24. (New): The one or more storage media of claim 17 further comprising: instructions to store a row of said table in a hash cluster.

25. (New): The one or more storage media of claim 17 wherein said storage device comprises at least one of a disk, a chip and a cartridge.


*Allowable Subject Matter*

5.      Claims 1, 3-11 and 13-25 are allowed (Renumber as 1-23).

This communication warrants no examiner's reason for allowance, as applicant's reply makes evident the reason for allowance, satisfying the record as whole as required by rule 37 CFR 1.104 (e). In this case, the substances of applicant's remarks filed on October 22, 2009 with respect to the amended claim limitations point out and make clear the reason claims are patentable over the prior arts of record such as Agarwal et al. (US Pat. No. 7,080,081 B2), Machado et al. (US Pat. No. 5,517,631), Vagnozzi (US Pat. No. 6,070,164), Debrunner (US Pat. No. 6,321,234 B1), Matsumani et al. (US Pat. No. 5,619,690 A), Duvillier et al. (US Pub. No. 2002/0103815 A1), Gold (US Pub. No. 2002/0116573 A1), and Robinson et al. (US Pat. No. 6,032,219 A). Thus, the reason for allowance is in all probability evident from the record and no statement for examiner's reason for allowance is necessary (see MPEP 13202.14).


6.      Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance".

## *Contact Information*

7.      Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Bai D. Vu whose telephone number is (571)270-1751.

The examiner can normally be reached on Mon - Fri 8:30 - 5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Neveen Abel-Jalil can be reached on 571-272-4074. The fax phone number

for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the

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published applications may be obtained from either Private PAIR or Public PAIR.

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. D. V./
Examiner, Art Unit 2165
1/14/2010

/Neveen  Abel-Jalil/

Supervisory Patent Examiner, Art Unit 2165